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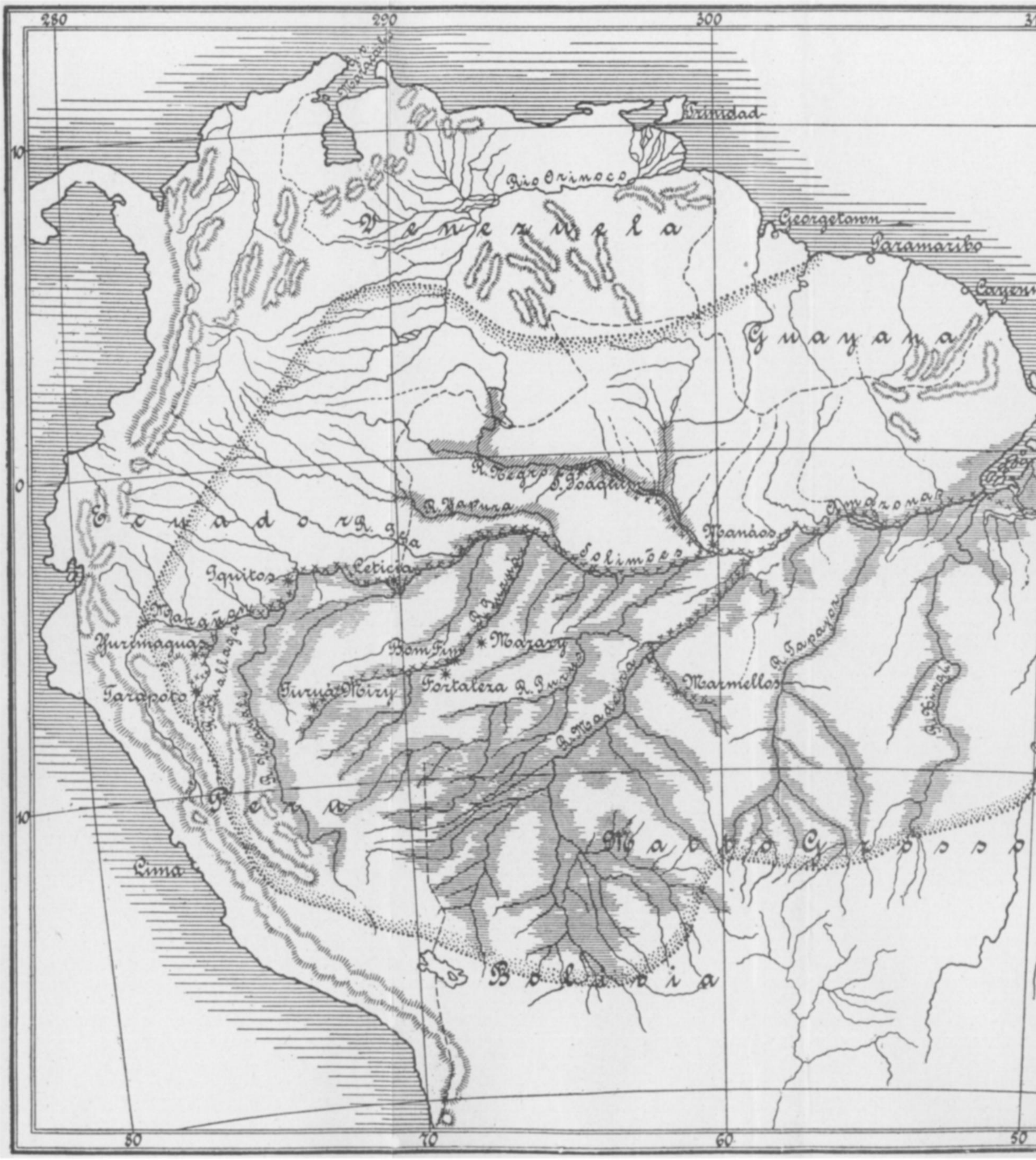
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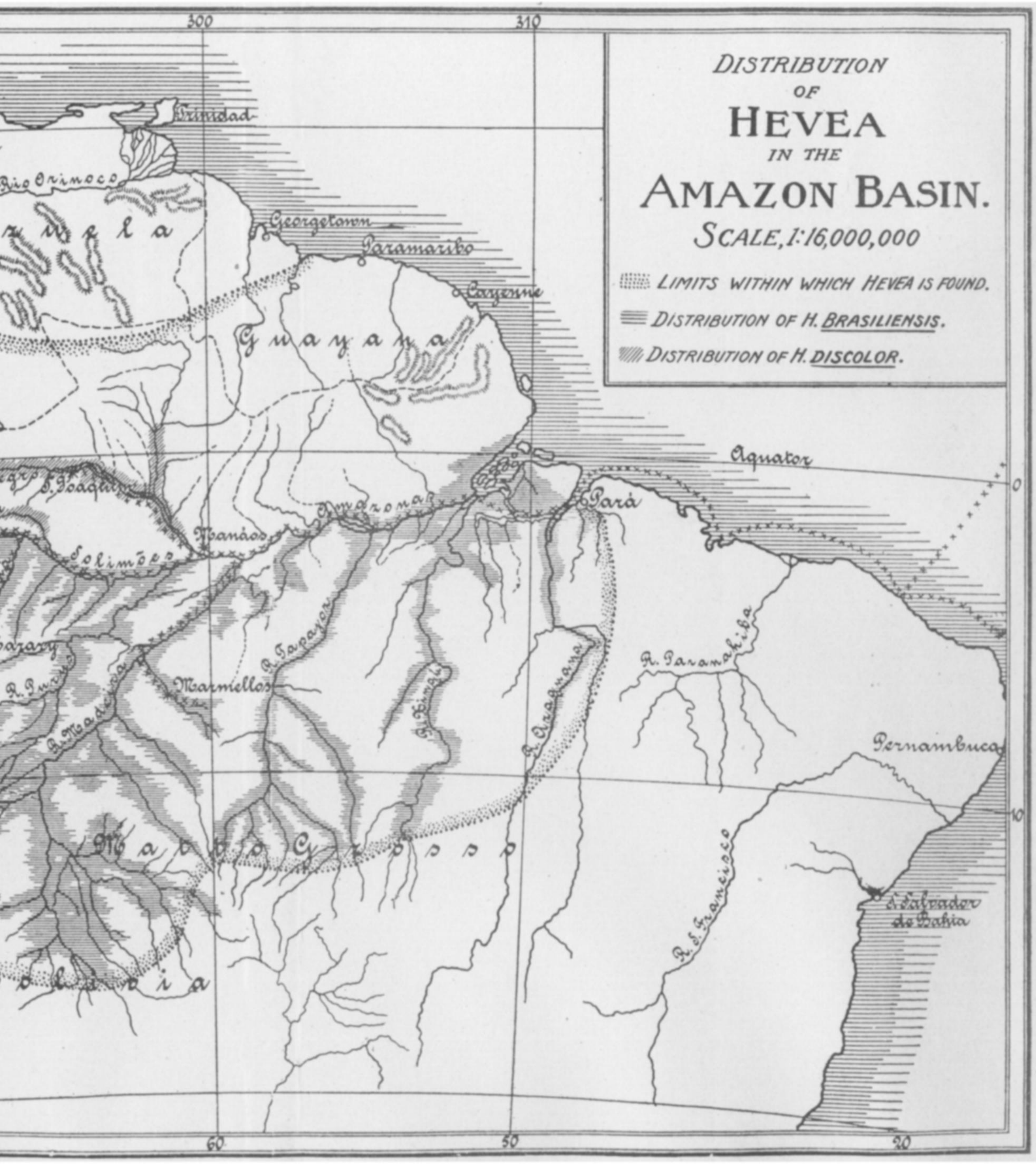

Two other matters are well worth our serious consideration—namely, co-operation with the commercial interests of this great city, and co-operation with the Government in its rapidly-expanding geographical interests. In these two directions lie broad avenues, by which we may continuously and permanently make our vigorous impress upon the geographical and commercial work and thought of the country.

RUBBER IN THE AMAZON BASIN.

The map printed herewith is taken from the "Beihefte zum *Tropenpflanzer*" (No. 1, Jan., 1905), the monthly published in Berlin by the Kolonial-Wirtschaftliches Komitee. This periodical covers the increasingly important field of tropical agriculture. Each number contains the results of agricultural experiment stations and reports of progress from all parts of the torrid zone, treating the German colonies with especial fulness.

The present supplement of 71 pp. gives the report of Mr. E. Ule's expedition in 1900–03 through a large part of the rubber territory of the Amazon Basin. His purpose was to study the methods of collecting rubber and the conditions of the rubber trade at the largest source of supply. His journeys took him from Pará up the Amazon and Marañon Rivers to the western line of rubber production on the eastern slopes of the Cordilleras. He ascended the Rio Negro, the great northern tributary, for over 300 miles, and made long journeys up some of the southern affluents and their tributaries, the Madeira, the Giparaná, the Juruá, and the Huallaga. His map shows the distribution of *Hevea*, which supplies the most valuable rubber exported from South America. *Hevea Brasiliensis* is the source of Pará rubber.

The distribution of rubber plants, especially *Hevea*, extends through the Amazon Basin to the Guianas and southern Venezuela. The southern half of the basin yields most of the product. Here the *Hevea Brasiliensis* thrives, the larger part of its output now coming from the Madeira, Purús, and Juruá Rivers. *Hevea Discolor*, characteristic of the black water rivers of the basin, is also important in trade. Mr. Ule describes eleven other varieties of *Hevea*, most of which have little importance in the rubber trade, though some of them are used to mix with Pará rubber.

There are no rubber forests on the Amazon as we would speak of oak or pine forests. The rubber trees are scattered among other kinds of timber, and form only a small percentage of the trees. The whole basin, especially the southern part of it, is covered with limitless forests, with only here or there a campo or plain of comparatively small extent.

The methods of collecting rubber from the *Hevea* and the *Castilloa* have been briefly described in the BULLETIN (Vol. XXX, pp. 275–276). The reader who desires exhaustive details is referred to Mr. Ule's pamphlet. In brief, the rubber-collector can care for about 200 *Hevea* trees, collecting sap from half of them on one day and from the other half on the next day. The season covers the drier months, from May to October. Every morning the workman goes from tree to tree, making short incisions with a small hatchet. Under each incision he presses the sharp lip of a tin cup in which the sap is caught. The wound soon heals, and *Hevea Brasiliensis* yields annually for four or five years, when the tree is given a year's rest.

Castilloa, which yields caucho or caoutchouc, is also widely distributed, but there is danger of its being exterminated, as the tree is destroyed in order to obtain the milk.

The transportation question is very important. On some of the smaller rivers rubber cannot always be transported, even by canoe, and it is necessary for men to carry the loads on their backs for short distances. But the product is carried to great trading-points like Manaos and Pará only by steamboat, and there is regular steam traffic on all the larger rivers where rubber-collecting is important.

Manaos is the collecting-point for the central and upper basin, while the rubber of the lower river and its two great tributaries, the Tapajoz and Xingú, is tributary to Pará. In 1880 the total rubber yield of the Amazon Basin was only 8,680 tons. Ten years later the product had almost exactly doubled; and in 1900, 8,937 tons were shipped from Manaos and 17,812 tons from Pará, or 26,749 tons from the Amazon Basin in a total world product of 51,001 tons. It was not till 1901 that the development of rubber-collecting along the great rivers tributary to Manaos enabled that city to surpass Pará in quantity of rubber prepared for market. Since that time Manaos has kept well ahead of Pará in this trade. In 1903 the exports from Manaos were 18,277 tons; from Pará, 12,817; from the Amazon Basin, 31,094 tons, or more than half of the world's product, the total output being 61,759 tons.

For the five years ending with 1903 the annual yield of caucho, or rubber, from the *Castilloa* amounted to from 3,247 to 3,906 tons, while the production of rubber from *Hevea* varied from 13,469 to 16,546 tons.

The central and upper Amazon Basin are now the most important fields of rubber production. It is interesting to observe the relative importance of the various rivers in production. In 1903 the upper Amazon, with the Javary and the streams above Iquitos, yielded 4,130 tons; the Juruá, 4,537; the Purús, 7,395; the Madeira, 2,963.

Various attempts have been made along the Amazon to form plantations of *Hevea* trees. These experiments have not been very successful, and the fact has been chiefly ascribed to the comparatively high price of labour and the inability of the planters to give adequate care to the young trees. There seems to be no doubt, however, that rubber trees may be successfully raised on Brazilian plantations. Experiments show that a tree of *Hevea Brasiliensis* in a well-kept plantation will yield within fifteen years after planting, while a tree in the forest requires twenty-five years.

The fact is now well known that many comparative experiments in tropical countries with some or all of the established rubber plants have demonstrated the superiority of *Hevea Brasiliensis*. One of the latest accounts is from Mr. W. H. Johnson, Director of Agriculture on the Gold Coast, West Africa, who reports that experiments in the botanic gardens at Aburi were unsuccessful with West African, Ceará, Assam, and Central American rubber plants. Fairly satisfactory results were obtained with the indigenous *Funtumia elastica;* but *Hevea* excelled in quantity and quality of rubber and in its rate of growth, and has been remarkably free from insects and fungus pests.

TOPOGRAPHY AND TRAVEL IN PENNSYLVANIA.

BY

WALTER S. TOWER.

The earliest lines of travel in Pennsylvania, Indian trails, and tracks through the wilderness took little heed of surface form. On the old maps many trails may be seen running directly across steep mountain ridges and through deep valleys, with no apparent attempt to seek out the easiest routes. To-day the more improved modes of travel seem to be less independent. Throughout the State, both highways and railroads are directly controlled by the topographic conditions of the region.